

Moreover, since a focusing length, a focusing position, and the like become important information when the image processing is carried out, it is better if they are included in the recording information. For example, when image processing is carried out upon printing, processing for extracting a main target object may be carried out for especially improving a picture quality of the main target object. If information relevant to focus is added as the recording information, it is judged that the main target object exists in an area of focus, and a complex extracting processing does not need to be carried out.

For reflecting on an image processing a kind and strength of light in the environment in which a picture image is recorded, it is preferable that a lighting condition obtained by a color temperature sensor or an exposure meter, whether or not a flash is used, and the outdoor weather at the time of recording if the recording is carried out outdoors, are included in the recording information.

It is also possible to add to image data the date and time of recording, or a theme title of the picture as a portion of the recording information.

The recording information adding unit 6 obtains the above recording information relevant to values specific to the camera from a setting of a camera upon shipment. On the other hand, the recording information adding unit 6 obtains recording information varying at each recording from the image pickup unit 4 or the AE processing unit 5 upon necessity by receiving data therefrom. The recording information adding unit 6 organizes the recording information into a predetermined format and adds the recording information to image data. More specifically, when image data are obtained and stored in a built-in memory or in a card memory, image data 8 together with the recording information 9 are stored in a set in an image file 7.

The digital image data having been stored in a memory in a digital camera are stored in an image server 2 via a card reader and a cable. Any ordinarily-used data copying method including the method using a network can be used as a method to copy the image file onto the image server 2.

On the other hand, the image reproducing apparatus 3 of the present invention is used to carry out sequential reproduction processes on image files 7 stored in the image server 2. The image reproducing apparatus 3 comprises a set-up processing unit 11 for carrying out image processing to enhance a picture quality of image data in each image file 7, a printer 12 or a display interface 13 for respectively outputting the image data having been set up by the set-up processing unit 11 in the form of a print 14 or in the form of a display on a monitor 15. The above recording information 9 is used directly for the processing in the set-up unit 11 or for judgment as to whether or not a predetermined processing should be carried out.

The set-up processing unit 11 carries out the processing according to a predetermined algorithm based on the recording information 9, and carries out the image processing by finding an optimal image processing condition. An image processing condition 10 may be added to image data 8 on this occasion. In this manner, it becomes unnecessary to carry out the same processing again when a print is created as an extra print for example, which leads to less time and cost. Furthermore, a print needs a higher picture quality than a display on a monitor. Therefore, once an image processing condition has been found and saved for the print, a high picture quality image can thereafter be displayed in a short time by using the saved information, when the image data are displayed on a monitor.

In the above explanation, a laboratory system has been used as an example, since a high quality picture image is especially needed by a print. However, the present invention can also be applicable to a case where a user enjoys an image using a personal computer. In other words, it becomes possible to display a high quality picture image on a monitor by carrying out the image processing using the recording information 9 with a personal computer in the same manner as does the above laboratory system.

What is claimed is:

1. An image reproducing method comprising:

obtaining digital image data recorded by a digital image recording device

obtaining recording information representing a recording condition specific to the digital image recording device;

storing the digital image data and the recording information together as an image file together in an image server;

carrying out image processing of the image file for enhancing a picture quality of the digital image data having been stored in the storage medium by using the stored recording information to determine an optimal image processing condition; and

reproducing the digital image data on which the image processing has been carried out based on the optimal image processing condition.

2. The image reproducing method as defined in claim 1, before the carrying out image processing step, further comprising:

adding the optimal image processing condition to the digital image data and the recording information for storage as the image file, wherein

the carrying out step carries out the image processing of the image file stored in the storage medium for enhancing the picture quality of the digital image data based on the stored optimal image processing condition added to the image file.

3. An image reproducing apparatus comprising:

image serving means for storing digital image data and recording information together as an image file in an image server;

image processing means for carrying out an image processing of the image file for enhancing a picture quality of the digital image data using the stored recording information to determine an optimal image processing condition; and

reproducing means for reproducing the digital image data processed by the image processing means based on the optimal image processing condition.

4. The image reproducing apparatus as defined in claim 2 or 5, comprising recording information adding means for adding the recording information to the digital image data.

5. The image reproducing apparatus as defined in claim 3, further comprising:

means for adding the optimal image processing condition to the digital image data and the recording information for storage as the image file, wherein

the image processing means carries out the image processing of the image file stored in the storage medium for enhancing the picture quality of the digital image data based on the stored optimal image processing condition added to the image file.

6. The image reproducing method as defined in claim 1, further comprising:

adding a content of AE processing the recording information.

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7. The image reproducing method as defined in claim 1, further comprising:
 adding a designation indicating a direction to halt additional correction to the recording information.
8. The image reproducing method as defined in claim 1, further comprising:
 adding a trimming designation function indicator to the recording information for designating an area of the digital image data to be trimmed.
9. The image reproducing method as defined in claim 1, further comprising:
 adding at least one of a focusing length and a focusing position to the recording information.
10. The image reproducing method as defined in claim 1, further comprising:
 adding at least one of a lighting condition obtained from a color sensor or exposure meter, a flash occurrence condition, and an outdoor weather indicator to the recording information.
11. The image reproducing method as defined in claim 1, further comprising:
 adding a title of the digital image data to the recording information.
12. The image reproducing apparatus as defined in claim 3, further comprising:
 means for adding a content of AE processing the recording information.
13. The image reproducing apparatus as defined in claim 3, further comprising:
 means for adding a designation indicating a direction to halt additional correction to the recording information.
14. The image reproducing apparatus as defined in claim 3, further comprising:
 means for adding a trimmings designation function indicator to the recording information for designating an area of the digital image data to be trimmed.
15. The image reproducing apparatus as defined in claim 3, further comprising:

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- means for adding at least one of a focusing length and a focusing position to the recording information.
16. The image reproducing apparatus as defined in claim 3, further comprising:
 means for adding at least one of a lighting condition obtained from a color sensor or exposure meter, a flash occurrence condition, and an outdoor weather indicator to the recording information.
17. The image reproducing apparatus as defined in claim 3, further comprising:
 means for adding a title of the digital image data to the recording information.
18. An image reproducing apparatus system comprising:
 an image pick up unit that records digital image data;
 a processing unit that provides automatic exposure processing to the digital image data; and
 a recording information adding unit that adds recording information including a ratio of an input light amount versus an output voltage of the digital camera to the digital image data and stores the digital image data and the recording information together as an image file in an image server.
19. The image reproducing apparatus system of claim 18 further comprising:
 image serving means for storing digital image data and the recording information together as an image file in an image server;
 image processing means for carrying out an image processing of the image file for enhancing a picture quality of the digital image data using the stored recording information to determine an optimal image processing condition; and
 reproducing means for reproducing the digital image data processed by the image processing means based on the optimal image processing condition.

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20. A method for processing image data, comprising:

receiving digital image data recorded by a digital image recording device wherein recording information, which is used to enhance picture quality, is added to the digital image data;

storing the digital image data and the recording information together as an image file; and

processing the digital image data of the stored image file using the recording information to enhance picture quality.

21. The method of claim 20, further including:

determining at least one optimal image processing condition to be included in the recording information;

processing the digital image data of the image file using the at least one optimal image processing condition; and

reproducing the digital image using the processed digital image data.

22. The method of claim 20, wherein the recording information includes at least one of a content of AE processing, a designation for no correction wherein no correction to the digital image data will be made using the recording information during processing, mode setting information wherein additional processing will occur based on the mode setting information, a trimming designation for designating an area of the digital image data to be trimmed, a focusing length, a focusing position, a lighting condition, a flash occurrence condition, descriptive text information, and an outdoor weather indicator.

23. The method of claim 22, wherein the lighting condition may be obtained from at least one of a color sensor and exposure meter.

24. The method of claim 22, wherein mode setting information may include at least one of a portrait designation, a sun set designation, a snow designation, a scenery designation, and a monochrome designation.

25. The method of claim 20, further including reproducing the image using the processed digital image data.

26. The method of claim 25, wherein the image is reproduced using at least one of a monitor and a printer.

27. The method of claim 20, wherein processing employs a look-up table.

28. A method for recording image data, comprising:

receiving digital image data recorded by a digital image recording device wherein recording information, which is used to enhance picture quality, is added to the digital image data; and

storing the digital image data and the recording information together as an image file to facilitate reproduction of the image from the stored digital image data including the

recording information to enable processing with the recording information to enhance picture quality.

29. The method of claim 28, further including:

determining at least one optimal image processing condition to be included in the recording information;

processing the digital image data of the image file using the at least one optimal image processing condition; and

reproducing the digital image using the processed digital image data.

30. The method of claim 28, wherein the recording information includes at least one of a content of AE processing, a designation for no correction wherein no correction to the digital image data will be made using the recording information during processing, mode setting information wherein additional processing will occur based on the mode setting information, a trimming designation for designating an area of the digital image data to be trimmed, a focusing length, a focusing position, a lighting condition, a flash occurrence condition, descriptive text information, and an outdoor weather indicator.

31. The method of claim 30, wherein the lighting condition may be obtained from at least one of a color sensor and exposure meter.

32. The method of claim 30, wherein mode setting information may include at least one of a portrait designation, a sun set designation, a snow designation, a scenery designation, and a monochrome designation.

33. The method of claim 28, further including reproducing the image using the processed digital image data.

34. The method of claim 33, wherein the image is reproduced using at least one of a monitor and a printer.

35. The method of claim 28, wherein reproduction of the image includes processing the digital image data and the recording information while employing a look-up table.

36. A method for processing image data, comprising:

receiving digital image data representing an image recorded by a digital image recording device;

adding recording information, which is used to enhance picture quality, to the digital image data to form an image file; and

processing the digital image data using the recording information.

37. The method of claim 36, further including:

reproducing the processed digital image data.

38. The method of claim 36, further including:

determining at least one optimal image processing condition to be included in the recording information;

processing the digital image data of the image file using the at least one optimal image processing condition; and

reproducing the digital image using the processed digital image data using the at least one optimal image processing condition.

39. The method of claim 36, wherein the recording information includes at least one of a content of AE processing, a designation for no correction wherein no correction to the digital image data will be made using the recording information during processing, mode setting information wherein additional processing will occur based on the mode setting information, a trimming designation for designating an area of the digital image data to be trimmed, a color condition, a focusing length, a focusing position, a lighting condition, a flash occurrence condition, descriptive text information, and an outdoor weather indicator.

40. The method of claim 39, wherein the lighting condition may be obtained from at least one of a color sensor and exposure meter.

41. The method of claim 39, wherein mode setting information may include at least one of a portrait designation, a sun set designation, a snow designation, a scenery designation, and a monochrome designation.

42. The method of claim 37, wherein the image is reproduced using at least one of a monitor and a printer.

43. The method of claim 36, wherein processing employs a look-up table.

44. The method of claim 36, wherein the processing obtains the digital image data and recording information from the image file.

45. A method for reproducing images, comprising:

receiving digital image data representing an image recorded by a digital image recording device wherein recording information, which is used to enhance picture quality, is added to the digital image data;

storing the digital image data and the recording information together as an image file in memory;

processing the digital image data utilizing the recording information to enhance picture quality; and

reproducing the processed digital image data.

46. The method of claim 45, further including:

determining at least one optimal image processing condition to be included in the recording information;

processing the digital image data of the image file using the at least one optimal image processing condition; and

reproducing the digital image using the processed digital image data using the at least one optimal image processing condition.

47. The method of claim 45, wherein the recording information includes at least one of a content of AE processing, a designation for no correction wherein no correction to the digital image data will be made using the recording information during processing, mode setting information wherein additional processing will occur based on the mode setting information, a trimming designation for designating an area of the digital image data to be trimmed, a color condition, a focusing length, a focusing position, a lighting condition, a flash occurrence condition, descriptive text information, and an outdoor weather indicator.

48. The method of claim 47, wherein the lighting condition may be obtained from at least one of a color sensor and exposure meter.

49. The method of claim 47, wherein mode setting information may include at least one of a portrait designation, a sun set designation, a snow designation, a scenery designation, and a monochrome designation.

50. The method of claim 45, wherein the image is reproduced using at least one of a monitor and a printer.

51. The method of claim 45, wherein the memory is at least one of random access memory, a secondary storage device and an image server.

52. The method of claim 45, wherein processing employs a look-up table.

53. An apparatus for processing image data, comprising:

a receiver receiving digital image data recorded by a digital image recording device and further providing recording information related to the digital image data and usable to enhance picture quality;

a storage module storing the digital image data and the recording information together as an image file; and

a processor, operatively connected to the storage module, for processing the digital image data of the stored image file using the recording information to enhance picture quality.

54. The apparatus of claim 53, further including:

a determining module determining at least one optimal image processing condition to be included in the recording information;

said processor processing the digital image data of the stored image file using the at least one optimal image processing condition; and

a reproducer reproducing the digital image using the processed digital image data.

55. The apparatus of claim 53, wherein the recording information includes at least one of a content of AE processing, a designation for no correction wherein no correction to the digital image data will be made using the recording information during processing, mode setting

information wherein additional processing will occur based on the mode setting information, a trimming designation for designating an area of the digital image data to be trimmed, a focusing length, a focusing position, a lighting condition, a flash occurrence condition, descriptive text information, and an outdoor weather indicator.

56. The apparatus of claim 55, wherein the lighting condition may be obtained from at least one of a color sensor and exposure meter.

57. The apparatus of claim 55, wherein mode setting information may include at least one of a portrait designation, a sun set designation, a snow designation, a scenery designation, and a monochrome designation.

58. The apparatus of claim 53, further including a reproducer reproducing the image using the processed digital image data.

59. The apparatus of claim 58, wherein the reproducer uses at least one of a monitor and a printer.

60. The apparatus of claim 53, wherein the processor employs a look-up table.

61. An apparatus for recording image data, comprising:

a receiver receiving digital image data recorded by a digital image recording device relating recording information to the digital image data and usable to enhance picture quality; and

a storage module storing the digital image data and the recording information together as an image file to facilitate reproduction of the image from the stored digital image data using the recording information to enhance picture quality.

62. The apparatus of claim 61, further including:

a determining module for determining at least one optimal image processing condition to be included in the recording information;

a processor processing the digital image data of the stored image file using the at least one optimal image processing condition; and

a reproducer reproducing the digital image using the processed digital image data.

63. The apparatus of claim 61, wherein the recording information includes at least one of a content of AE processing, a designation for no correction wherein no correction to the digital image data will be made using the recording information during processing, mode setting information wherein additional processing will occur based on the mode setting information, a trimming designation for designating an area of the digital image data to be trimmed, a focusing length, a focusing position, a lighting condition, a flash occurrence condition, descriptive text information, and an outdoor weather indicator.

64. The apparatus of claim 63, wherein the lighting condition may be obtained from at least one of a color sensor and exposure meter.

65. The apparatus of claim 63, wherein mode setting information may include at least one of a portrait designation, a sun set designation, a snow designation, a scenery designation, and a monochrome designation.

66. The apparatus of claim 61, further including a reproducer reproducing the image using the processed digital image data.

67. The apparatus of claim 66, wherein the reproducer uses at least one of a monitor and a printer.

68. The apparatus of claim 61, further comprising a reproducer reproducing the image including processing the digital image data and the recording information, the reproducer including a look-up table.

69. An apparatus for processing image data, comprising:

a receiver receiving digital image data representing an image recorded by a digital image recording device;

an adder adding to the digital image data, recording information, which is used to enhance picture quality, to form an image file; and

a processor processing the digital image data using the recording information.

70. The apparatus of claim 69, further including:

a reproducer reproducing the processed digital image data.

71. The apparatus of claim 69, further including:

a determining module for determining at least one optimal image processing condition to be included in the recording information;

a processor processing the digital image data using the at least one optimal image processing condition; and

a reproducer reproducing the digital image using the processed digital image data using the at least one optimal image processing condition.

72. The apparatus of claim 69, wherein the recording information includes at least one of a content of AE processing, a designation for no correction wherein no correction to the digital image data will be made using the recording information during processing, mode setting information wherein additional processing will occur based on the mode setting information, a trimming designation for designating an area of the digital image data to be trimmed, a color condition, a focusing length, a focusing position, a lighting condition, a flash occurrence condition, descriptive text information, and an outdoor weather indicator.

73. The apparatus of claim 72, wherein the lighting condition may be obtained from at least one of a color sensor and exposure meter.

74. The apparatus of claim 72, wherein mode setting information may include at least one of a portrait designation, a sun set designation, a snow designation, a scenery designation, and a monochrome designation.

75. The apparatus of claim 70, wherein the reproducer uses at least one of a monitor and a printer.

76. The apparatus of claim 69, wherein the processor employs a look-up table.

77. The apparatus of claim 69, wherein the processor obtains the digital image data and recording information from the image file.

78. An apparatus for reproducing images, comprising:

a receiver receiving digital image data representing an image recorded by a digital image recording device relating recording information to the digital image data and used to enhance picture quality;

a storage module storing the digital image data and the recording information together as an image file in memory;

a processor operatively connected to the storage module processing the digital image data utilizing the recording information to enhance picture quality; and

a reproducer reproducing the processed digital image data.

79. The apparatus of claim 78, further including:

a determining module determining at least one optimal image processing condition to be included in the recording information;

a processor processing the digital image data using the at least one optimal image processing condition; and

a reproducer reproducing the digital image using the processed digital image data using the at least one optimal image processing condition.

80. The apparatus of claim 78, wherein the recording information includes at least one of a content of AE processing, a designation for no correction wherein no correction to the digital image data will be made using the recording information during processing, mode setting information wherein additional processing will occur based on the mode setting information, a trimming designation for designating an area of the digital image data to be trimmed, a color condition, a focusing length, a focusing position, a lighting condition, a flash occurrence condition, descriptive text information, and an outdoor weather indicator.

81. The apparatus of claim 80, wherein the lighting condition may be obtained from at least one of a color sensor and exposure meter.

82. The apparatus of claim 80, wherein mode setting information may include at least one of a portrait designation, a sun set designation, a snow designation, a scenery designation, and a monochrome designation.

83. The apparatus of claim 78, wherein the reproducer uses at least one of a monitor and a printer.

84. The apparatus of claim 78, wherein the memory is at least one of random access memory, a secondary storage device and an image server.

85. The apparatus of claim 78, wherein the processor employs a look-up table.

86. A computer-readable medium containing instructions to record image data to perform a method, the method comprising:

receiving digital image data recorded by a digital image recording device wherein recording information, which is used to enhance picture quality, is added to the digital image data;

storing the digital image data and the recording information together as an image file to facilitate reproduction of the image from the stored digital image data including the recording information to enable processing with the recording information to enhance picture quality.

87. The computer-readable medium of claim 86, further including:

determining at least one optimal image processing condition to be included in the recording information;

processing the digital image data of the image file using the at least one optimal image processing condition; and

reproducing the digital image using the processed digital image data.

88. The computer-readable medium of claim 86, wherein the recording information includes at least one of a content of AE processing, a designation for no correction wherein no correction to the digital image data will be made using the recording information during processing, mode setting information wherein additional processing will occur based on the mode setting information, a trimming designation for designating an area of the digital image data to be trimmed, a focusing length, a focusing position, a lighting condition, a flash occurrence condition, descriptive text information, and an outdoor weather indicator.

89. The computer-readable medium of claim 88, wherein the lighting condition may be obtained from at least one of a color sensor and exposure meter.

90. The computer-readable medium of claim 88, wherein mode setting information may include at least one of a portrait designation, a sun set designation, a snow designation, a scenery designation, and a monochrome designation.

91. The computer-readable medium of claim 88, further including reproducing the image using the processed digital image data.

92. The computer-readable medium of claim 91, wherein the image is reproduced using at least one of a monitor and a printer.

93. The computer-readable medium of claim 91, wherein processing employs a look-up table.

94. A computer-readable medium containing instructions to reproduce images to perform a method, the method comprising:

receiving digital image data representing an image recorded by a digital image recording device wherein recording information, which is used to enhance picture quality, is added to the digital image data;

storing the digital image data and the recording information together as an image file in memory;

processing the digital image data utilizing the recording information to enhance picture quality; and

reproducing the processed digital image data.

95. The computer-readable medium of claim 94, further including:

determining at least one optimal image processing condition to be included in the recording information;

processing the digital image data of the stored image file using the at least one optimal image processing condition; and

reproducing the digital image using the processed digital image data using the at least one optimal image processing condition.

96. The computer-readable medium of claim 94, wherein the recording information includes at least one of a content of AE processing, a designation for no correction wherein no correction to the digital image data will be made using the recording information during processing, mode setting information wherein additional processing will occur based on the mode setting information, a trimming designation for designating an area of the digital image data to be trimmed, a color condition, a focusing length, a focusing position, a lighting condition, a flash occurrence condition, descriptive text information, and an outdoor weather indicator.

97. The computer-readable medium of claim 96, wherein the lighting condition may be obtained from at least one of a color sensor and exposure meter.

98. The computer-readable medium of claim 96, wherein mode setting information may include at least one of a portrait designation, a sun set designation, a snow designation, a scenery designation, and a monochrome designation.

99. The computer-readable medium of claim 94, wherein the image is reproduced using at least one of a monitor and a printer.

100. The computer-readable medium of claim 94, wherein the memory is at least one of random access memory, a secondary storage device and an image server.

101. The computer-readable medium of claim 94, wherein processing employs a look-up table.

102. A computer-storage medium storing at least one data file, wherein the at least one data file includes digital image data representing a recorded image and recording information, the recording information being usable to enhance picture quality and being related to at least one of a brightness condition, a contrast condition, a color condition, and a focus condition.

103. The computer-storage medium of claim 102, wherein the data file is further useable to:
determine at least one optimal image processing condition using the recording
information;
process the digital image data using the at least one optimal image processing
condition; and
reproduce the digital image using the processed digital image data.

104. The computer-storage medium of claim 102, wherein the recording information includes at least one of a content of AE processing, a designation for no correction wherein no correction to the digital image data will be made using the recording information during processing, mode setting information wherein additional processing will occur based on the mode setting information, a trimming designation for designating an area of the digital image data to be trimmed, a focusing length, a focusing position, a lighting condition, a flash occurrence condition, descriptive text information, and an outdoor weather indicator.

105. The computer-storage medium of claim 104, wherein the lighting condition may be obtained from at least one of a color sensor and exposure meter.

106. The computer-storage medium of claim 104, wherein mode setting information may include at least one of a portrait designation, a sun set designation, a snow designation, a scenery designation, and a monochrome designation.

107. The computer-storage medium of claim 102, further including reproducing the image using the processed digital image data.

108. The computer-storage medium of claim 103, wherein the image is reproduced using at least one of a monitor and a printer.

109. The method of claim 28, wherein the recording information includes a processing condition.

110. The method of claim 45, wherein the recording information includes a processing condition.

111. The apparatus of claim 61, wherein the recording information includes a processing condition.

112. The apparatus of claim 78, wherein the recording information includes a processing condition.

113. The computer-readable medium of claim 86, wherein the recording information includes a processing condition.

114. The computer-readable medium of claim 94, wherein the recording information includes a processing condition.

115. The computer-storage medium of claim 102, wherein the recording information includes a processing condition.